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Claims

1. A method for balancing out the differences in the injection quantities between the cylinders in an internal combustion engine whereby, for various operating points of the internal combustion engine, an adaptation of the differences in the injection quantities is carried out for at least one selected injection parameter, where the dynamics of a selected operating point are limited (step 3) during the adaptation, characterized in that the differences in the injection quantities are determined for the selected operating point and are learned as adaptation values (step 6) which are assigned to the injection parameter value concerned, and in that for the purpose of limiting the dynamics the injection parameter is set in such a way that the selected operating point remains essentially static.

2. The method as claimed in claim 1 characterized in that the learned adaptation values are used in calculating correction values individual to each cylinder, which are applied to at least one actuation parameter of an injection device on the internal combustion engine in such a way as to effect a balancing out of the injection quantities, time-traces of the injections and the start of the hydraulic injection.

3. The method as claimed in claim 2 characterized in that the injection device for each cylinder takes the form of an injector with a piezo-electric actuator,

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whereby the duration of the actuation, the time point of actuation and/or the duration of the recharging time are used as the actuation parameters.

4. The method as claimed in claim 3 characterized in that for each cylinder the start (t_3) of the discharge of the corresponding piezo-electric actuator takes place at the same crankshaft angle relative to top-dead-center for the corresponding piston of the internal combustion engine.

5. The method as claimed in at least one of the claims 3 or 4 characterized in that for each cylinder the end (t_2) of the recharging of the corresponding piezo-electric actuator takes place at the same crankshaft angle relative to top-dead-center for the corresponding piston of the internal combustion engine.

6. The method as claimed in at least one of the preceding claims characterized in that the durations of the discharge times ($10''$, $11''$) of all the actuators are the same.

7. The method as claimed in at least one of the claims 3 to 6 characterized in that the start and the duration of the recharging of the piezo-electric actuator are set in such a way that the actuator signal ($S1$, $S2$) which is generated for each injector occurs at the same crankshaft angle relative to top-dead-center for the corresponding piston of the internal combustion engine.

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8. The method as claimed in at least one of the preceding claims characterized in that the selected operating point is located in the no-load, partial load or full load region.